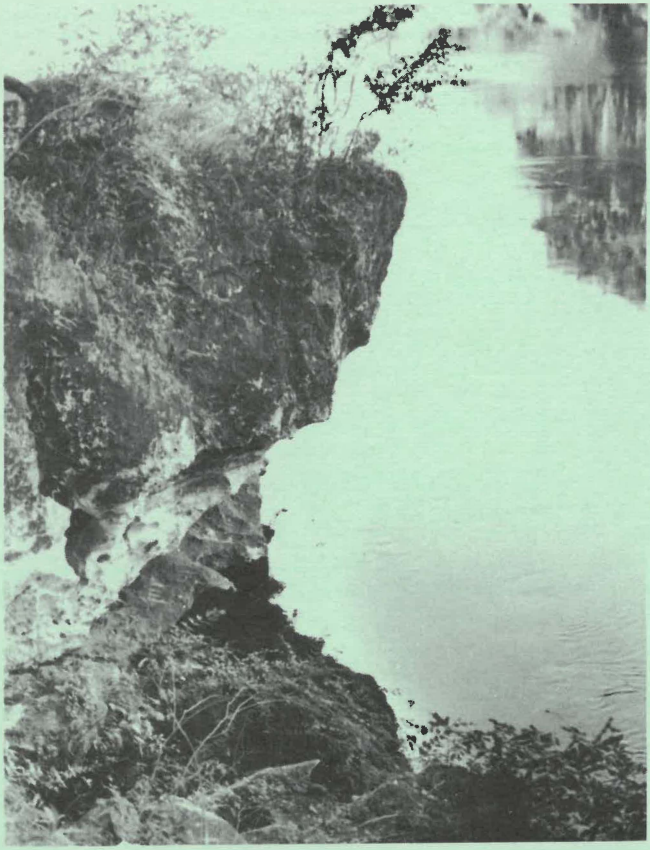
A GEOLOGIC GUIDE TO SUWANNEE RIVER, ICHETUCKNEE SPRINGS, O'LENO AND MANATEE SPRINGS STATE PARKS



FLORIDA DEPARTMENT OF NATURAL RESOURCES

TALLAHASSEE
1982

Leaflet No. 12

Page

On the cover: Limestone outcrop at Suwannee River State Park

Prepared by

Bureau of Geology
Division of Resource Management
Florida Department of Natural Resources

1982

A GEOLOGIC GUIDE TO SUWANNEE RIVER, ICHETUCKNEE SPRINGS, O'LENO, AND MANATEE SPRINGS STATE PARKS

by

Ronald Hoenstine and Sheila Weissinger

INTRODUCTION

Much of North Central Florida is sparsely populated and retains the nearly-untouched beauty of "Original Natural Florida," the Florida that greeted the early European explorers. Located in this area of scenic rivers and sparkling springs are several popular state parks, including Ichetucknee Springs, Manatee Springs, O'Leno and Suwannee River.

GENERAL TOPOGRAPHY

Much of the area's distinctive beauty is associated with small and large solution depressions, springs, and disappearing rivers; topographic features representative of a general landform designated as "karst" by geologists. These features develop in limestone regions having plentiful rainfall. Sinkholes are numerous in the area, and are conspicuous features in the parks.

SINKS

Sinks occur as a result of the dissolution of limestone by the downward percolation of rain water. Rain combines with carbon dioxide in the atmosphere to form carbonic acid. As this aci-

dic rain percolates downward through the soils it comes into contact and reacts with the underlying limestone. The result is dissolution of the limestone and the formation of cavities. As the cavities grow with time, the weight of the overlying sediments may cause collapse and the subsequent formation of a sinkhole. This process of formation may become accelerated in the future if this pristine area of Florida is subjected to increased amounts of acid rain.

Some of these sinkholes are filled with water, while others are "dry sinks." While both groups of sinkholes may have continuity with the underlying limestone, the dry sinks permit rain water to percolate completely into the underlying limestone.

SPRINGS

Also associated with this karst terrain are numerous springs. Florida has long been famous for its springs. In fact, there are more large springs in Florida than any other state, accounting for 27 of the nation's 78 major springs. It has been calculated that the total output of water from all of Florida's 300 known springs is around 8 billion gallons a day.

To more fully appreciate how and why springs form, one must understand the term "aquifer." Hydrologists define aquifers as natural zones below the ground surface that yield water in quantities that are important economically. In this part of Florida the aquifer, which is known as the Floridan Aquifer, is a thick layer of limestone. This limestone is divided into formal units called formations. These formations, which vary in age and lithology (physical characteristics), include the Suwannee Limestone and limestone of the Ocala Group.

Rocks must have two essential properties to

be considered an aquifer. They must have porosity and permeability. Porosity refers to the openings in the rocks which have the capacity to store water. Such openings include cavities, voids or intergranular spaces. The second property, permeability, is equally important as it refers to the rocks' ability to transmit water through interconnected pore spaces.

Although highly variable, parts of the Floridan Aquifer may contain as much as 30 percent open space capable of storing large quantities of water. Furthermore, the aquifer's permeability permits the movement of vast quantities of water to the surface via springs and wells.

A spring occurs when groundwater from the aquifer is discharged as natural seepage or freeflow through an opening at the ground surface. The volume of water discharged may be small and form a trickle, or large enough to form a river, such as the Ichetucknee River. The volume discharged frequently varies, as it is dependent not only on porosity and permeability but other factors such as seasonal rainfall that recharges the aquifer, and pumpage, which depletes it.

AGE OF THE GEOLOGIC FEATURES

An age (time of deposition) of about 30 million years before the present, during a period of time known as the Oligocene Epoch, can be assigned to the limestone and dolomite which crop out in the Suwannee River State Park. An age of about 40 million years before the present (Late Eocene Epoch) can be assigned to the limestone occurring at the surface in the vicinity of Manatee Springs, Ichetucknee and O'Leno state parks.

How do geologists determine the age of these rocks? A casual glance at the limestone

exposed in these parks reveals the presence of marine fossils such as clams and oysters, while a closer microscopic inspection reveals numerous microfossils. Microfossils are the remains of tiny plants and animals that lived long ago. These organisms include, among others, the silicabearing plants called diatoms, calcareous marine algae known as coccoliths, and calcareous one-celled animals known as foraminifera. The presence of microfossils in rocks serves as an important tool for various scientific groups, such as the Florida Bureau of Geology, in providing data for the dating of Florida's sedimentary rocks.

Essential to the study of microfossils is the accepted principle that various species of plants and animals lived and died during certain periods of Earth's history. Therefore, the identification of these species, together with a knowledge of their life span, permits one to date the sediments in which they are found.

ANCIENT ENVIRONMENTS

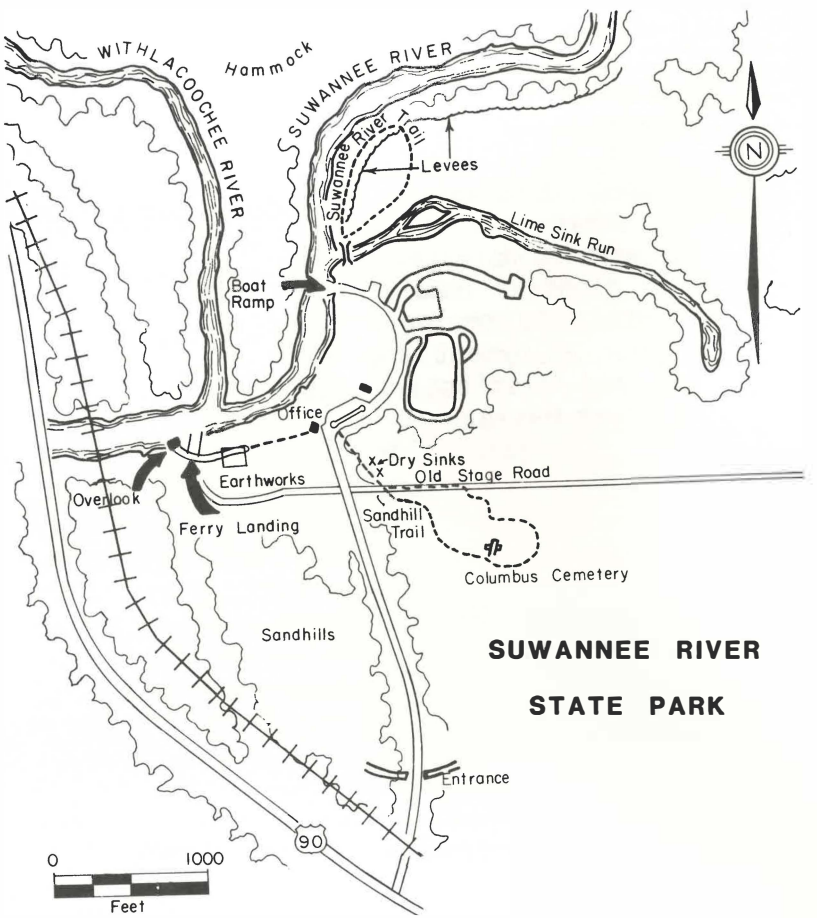
Microfossils' small size, wide geographic occurrence, and abundance in sediments of all ages and diverse environments are characteristics that make them invaluable for the purpose of identifying ancient depositional environments. Specifically, microfossils can be important indicators of the water depths, temperature, salinity, and water currents that existed at the time the sediments were formed. For this reason, the utilization of microfossils has been of special importance in the study of Florida's past and in identifying the depositional environments that existed in the area of the four parks 30 to 40 million years ago.

By comparing these microfossils with living relatives, we know that the sediments present in these parks were formed in a relatively shallow

marine environment. In other words, the limestone you see in the parks was once covered by a shallow sea. The period of time when the Florida peninsula was underwater represents most of the last 200 million years of geologic history.

The importance of microfossils to the study of Florida's past can be further illustrated by comparing the past environment of Florida to that of much of the rest of North America during the Cretaceous, a period of time that ended approximately 65 million years ago. During this period, when dinosaurs roamed much of North America, these parks, and indeed most of Florida, were underwater. This explains the absence of dinosaur remains in Florida.

We hope this geologic guide will serve to enhance your enjoyment and appreciation of the beautiful and distinctive state parks of the Suwannee River Basin.



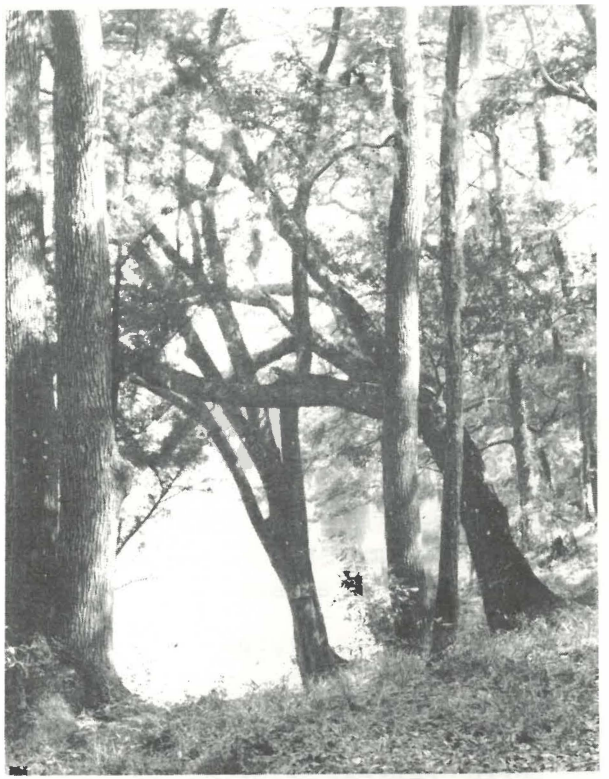
SUWANNEE RIVER STATE PARK

INTRODUCTION

The confluence of the Withlachoochee and Suwannee rivers offers a unique and historic setting for the Suwannee River State Park. Visitors to the park are impressed with the quiet natural beauty of the rivers and the surrounding wooded uplands. Situated in the physiographic zone known as the Coastal Lowlands, the park's elevation ranges from a low of 40 feet above MSL (mean sea level) near the river to a maximum of 70 feet MSL near the eastern boundary of the park.

THE RIVERS

Originating in the Okefenokee Swamp of southeast Georgia, the Suwannee River winds through north central Florida past the park, continuing its journey to the Gulf of Mexico, its final destination. Similarly, the Withlacoochee River originates in south Georgia and flows southward to merge with the Suwannee River at the park, where this confluence of the two rivers can be viewed from a rustic overlook (see map). The distinct differences in sediment loads of the rivers can be observed from this vantage point. The light brown waters of the Withlacoochee are laden with suspended silts and clays which give the river a muddy appearance. In contrast, the Suwannee River is relatively free of suspended sediment. Its dark, brownish-black color is a result of high tannic acid content. This tannic acid is produced by decayed



View of Suwannee River

The Confluence of the Withlacoochee and Suwannee rivers.

organic matter which washes into the river from forests and swamps that line the shore.

As the rivers flow southward they wind, or meander, resulting in rock and soil material being eroded from the outside and downstream side of river bends, while material is deposited on the inside and upstream side. You can observe this effect as you hike along the river trail.

LIMESTONE EXPOSURES

The effects of river erosion are evident in the park. As you walk southward along the river towards the earthworks and the overlook or northward along the river side of the Suwannee River Trail, you can observe limestone and dolomite outcrops on the south side of the river. The river has eroded the overlying sediments to expose these aged and weathered rocks.

These limestones, which are part of the Suwannee Limestone, were deposited during Oligocene time (30 million years before the present). Through time, much of the limestone has experienced substantial dolomitization. This process occurs when limestone, composed of the mineral calcite (a calcium carbonate), becomes a different mineral, dolomite, through the substitution of magnesium for calcium. As a result the rock, which in its original state was porous and permeable, may become dense and impermeable. In addition, fossils usually become distorted or completely obliterated through this process of dolomitization. A close examination will reveal fossil shells, molds and worm borings exhibiting all degrees of preservation. West of the overlook is a prominent

exposure of dolomite and limestone which, depending on the river stage, can measure more than 15 feet in height.

SUWANNEE RIVER TRAIL

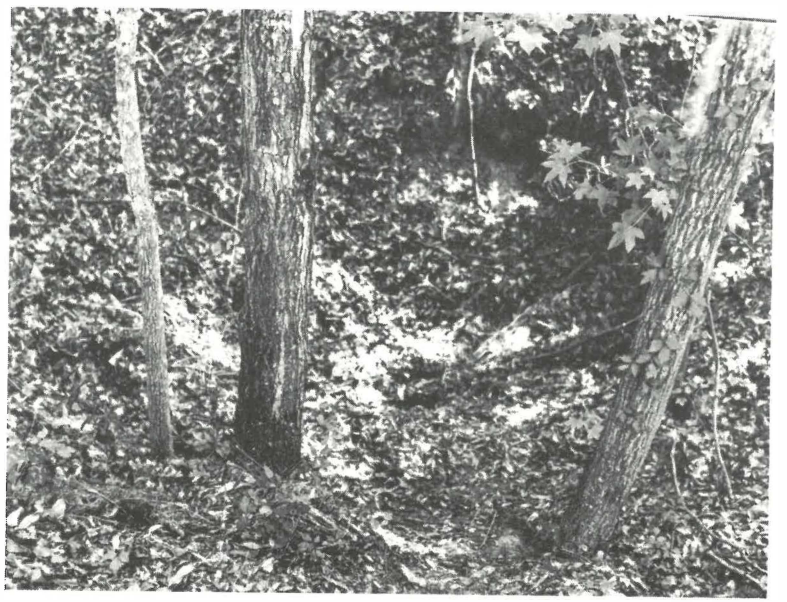
Walking along the Suwannee River Trail one can not only observe limestone outcrops but also see low banks parallel to the river on the eastern side of the trail (see map). These low ridges, called natural levees, are formed as a result of the river flooding. As the river overflows its banks, an abrupt decrease in both water velocity and turbulence occurs, resulting in the deposit of the coarser particles of the suspended sediments. In time, these coarse deposits form ridges, or levees, which generally parallel the river's edge.

SANDHILLS TRAIL

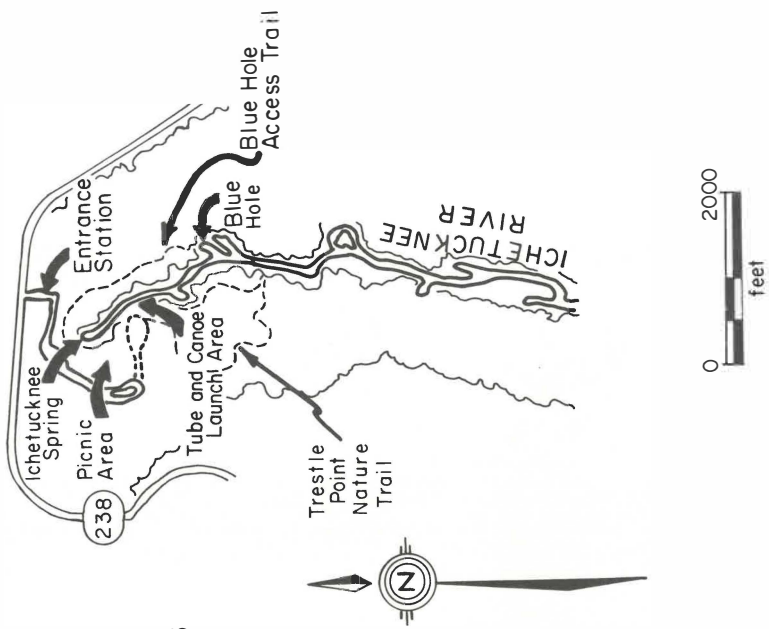
The Sandhills Trail leads from the hardwood hammock along the river to the open forest of pines. Approximately 500 feet down the trail one can see several dry sinks on the northeast side (see map). These geological features, which have a diameter of approximately 20 feet and a depth of 10 feet, are collapsed limestone cavities (see "sinks", page 2).

The trail continues to the Old Columbus Cemetery. The town of Columbus has long since disappeared, but some of its history remains on the weathered tombstones. One can see the results of weathering (especially the corrosive action of rain) on both the metal and stone markers. The once clearly legible monuments are now smooth due to the effects of rain and abra-

sion from wind-blown sediments over a relatively short period of time. Imagine the effects of weathering on Florida's landscape over a period of millions of years.



Dry sink along Sand Hills Trail



ICHETUCKNEE SPRINGS

STATE PARK

ICHETUCKNEE SPRINGS STATE PARK

INTRODUCTION

South of Suwannee River State Park, straddling the Suwannee-Columbia county line, is Ichetucknee Springs State Park, one of the most beautiful and popular parks in Florida. For many people its refreshing springs represent a cool oasis during the hot summer months. Elevations range from 25 feet MSL near the river to a maximum of 60 feet MSL in the western part of the park.

The surrounding area has many features typical of a karst area. These include wet and dry sinks and numerous springs.

THE SPRINGS

Within the 2,241 acres that make up the park and along the upper reaches of the Ichetucknee River are nine named and many unnamed springs. The most northern spring is Ichetucknee Spring which forms the headwaters of the river. Nearby is Blue Hole Spring, which can be reached by a trail and boardwalk from the main park.

Ichetucknee Spring is 75 feet wide and 105 feet long, and has a maximum depth of 14 feet. The spring has an average water temperature of 73°F and discharges 30 million gallons of water a day (based on measurements taken in 1975 by the U.S. Geological Survey).

The trail just north of Ichetucknee Springs leads to Blue Hole (Jug) Spring (see map). This secluded spring with its crystal clear, blue

waters is a favorite swimming site in the park. The spring is 85 feet wide, 125 feet long, and has a maximum depth of 37 feet at its north central end near the vent. The boil, which is clearly visible near the center of the pool, has a measured flow of 60 million gallons a day.

View of Ichetucknee Spring and spring run

LIMESTONE

The spring's waters issue directly from the limestone aquifer. The exposed limestone which forms part of the aquifer in this park is the Ocala Group limestone of Eocene age. These limestones, which are approximately 40 million years old, contrast with rocks cropping out in the Suwannee River State Park in that the exposed limestones there are the Suwannee Limestone of Oligocene age (approximately 30 million years before the present). Thus, as we have come southward, we have taken a 10 to 15 million year journey back in time. The missing, younger, Suwannee Limestone, which would ordinarily overlie the Ocala limestones, was either never deposited here or was completely eroded over time.

Limestone outcrop along Blue Hole Access Trail

These limestones offer further contrast to those in Suwannee River State Park in that little dolomitization can be observed here. Because these rocks are primarily limestone (calcium carbonate), the fossils show better preservation. However, the calcium carbonate content of these rocks causes them to be more susceptible to dissolution by acidic rain. Similiar to the limestone exposed at Suwannee River State Park, these limestones, though much older, also once formed the bottom of an ancient, shallow sea.

TRESTLE POINT NATURE TRAIL

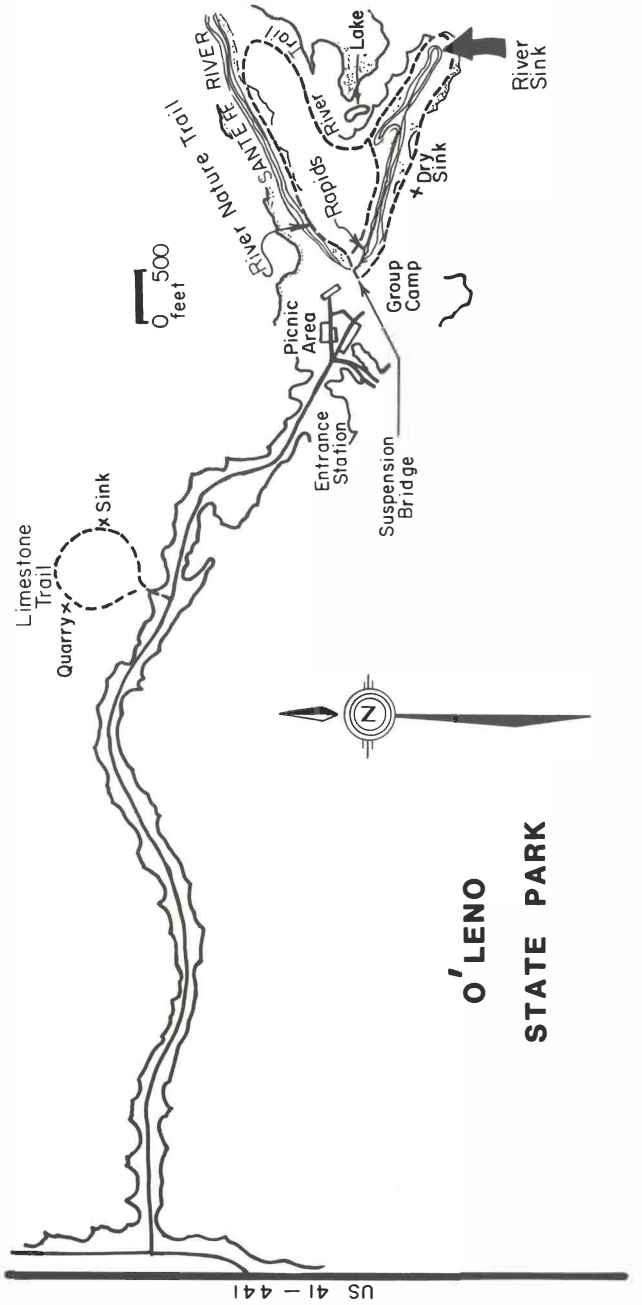
A walk along the clearly marked Trestle Point Nature Trail leads the visitor through hardwoods and pines that line the river (see map). Limestone outcrops of the Ocala Group can be seen along this trail at the river's edge. Directly across from Trestle Point you can see a tunnel formed by dissolution of the limestone. Other dissolution features observed along the river bank include cavities and irregular voids, many of which resemble caves and columns. These surface structures are very similar to features occurring in the limestone subsurface.

Farther down the trail you can see a large, circular depression approximately 60 feet to the left of the trail. This depression is a dry sink which formed through dissolution of the underlying limestone by rain water. Several additional sinks similar to this one can be observed within the park boundaries.

Continuing along the trail you will come to an overlook. This overlook permits you to see the remnants of an old hard rock phosphate mine which was being actively mined in the early 1900's. Note the trees' position and orientation with respect to the sloping sides. The distortion in their growing position is due to a process known as "soil creep." This process occurs as a result of gravity causing the slow, downhill movement of poorly-consolidated sediments, such as sands, that are present here. This movement, though very slow, has noticeable effects over time.

The closest active phosphate mining today occurs in Hamilton County at a site approximately 40 miles north of the park. Phosphate represents one of Florida's greatest mineral resources and production in Florida exceeds that of any other state.

Soil bank erosional features at Trestle Point



O'LENO STATE PARK

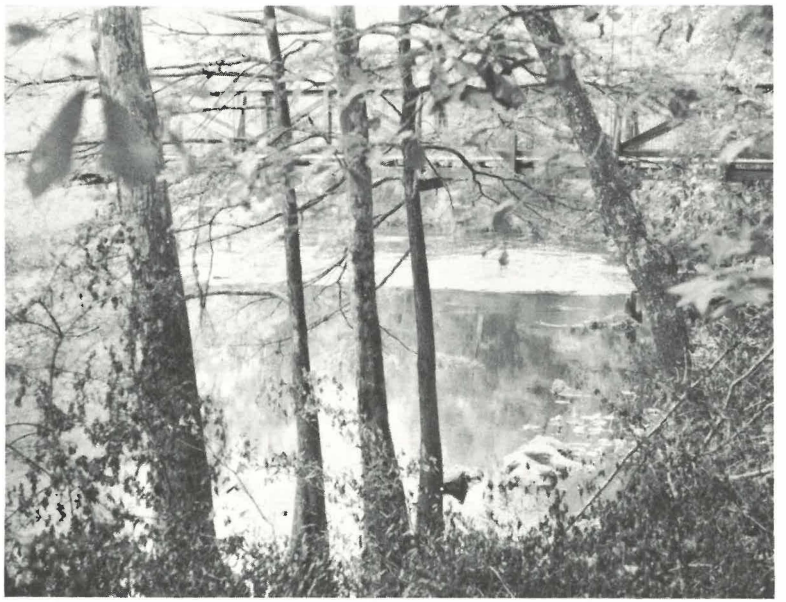
INTRODUCTION

A short drive south from Ichetucknee Springs State Park brings you to O'Leno State Park, located on the peaceful Santa Fe River. This interesting, scenic park has a general topography much like that of Ichetucknee, with numerous wet and dry sinks and limestone exposures. Elevations within its boundaries vary from a low of about 40 feet MSL to a maximum of approximately 79 feet MSL at the park's northwestern border.

THE RIVER

The Santa Fe River is fed by many springs and tributaries, including the Ichetucknee River, which joins the Santa Fe after a brief 5-1/2 mile journey from its headwaters. In contrast to the crystal clear Ichetucknee River, the waters of the Santa Fe are stained dark by tannic acid. The river's surface reflects like a mirror the luxuriant vegetation along the shore.

A suspension bridge, built in the 1930's by the Civilian Conservation Corps, spans the river at the main park (see map). Below it is a small rapid, created when local dolomitic limestones were placed there as part of the construction of a mill that once stood on this site. Many limestone outcrops occur along the river and park trails.

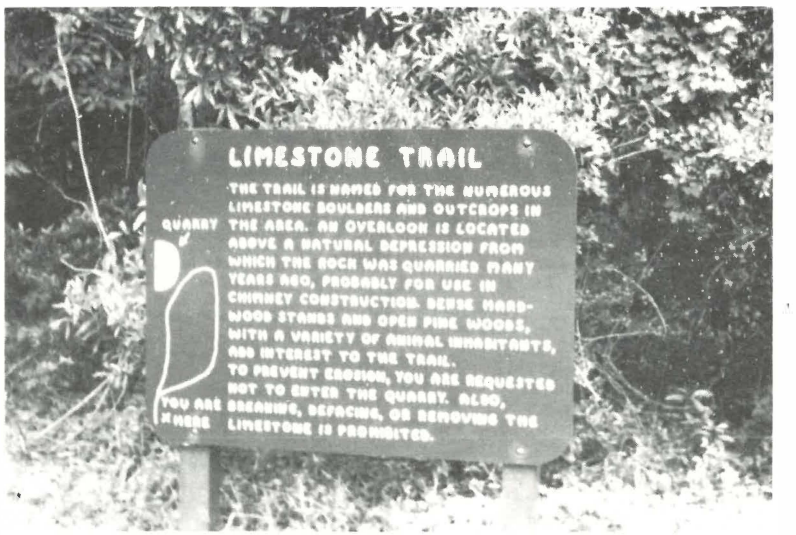


The suspension bridge spanning the Santa Fe River.

THE LIMESTONE TRAIL

Located to the left just past the park's entrance is the Limestone Trail (see map). This forest trail, which can be traveled in a leisurely 20-minute walk, presents the opportunity to observe numerous limestone boulders and are approximately 40 million years old, about the same age as those found in Ichetucknee Springs State Park to the north. In addition, one can observe an abandoned limestone quarry at the trail's overlook located on the northeastern side of the trail. Note the prominent limestone outcrop clearly visible at the south end of the quarry. Large quantities of limestone were mined from this now-inactive quarry for use in the construction of fireplace chimneys.

As you continue your walk, you will see a large sinkhole to your left on the western side of the trail.



RIVER NATURE TRAIL

From the main park and just across the suspension bridge, one comes to the River Nature Trail (see map). This picturesque trail leads through lowland hardwoods and sandy pine forests within the river's flood plain. Several features of geologic interest can be observed along the way.

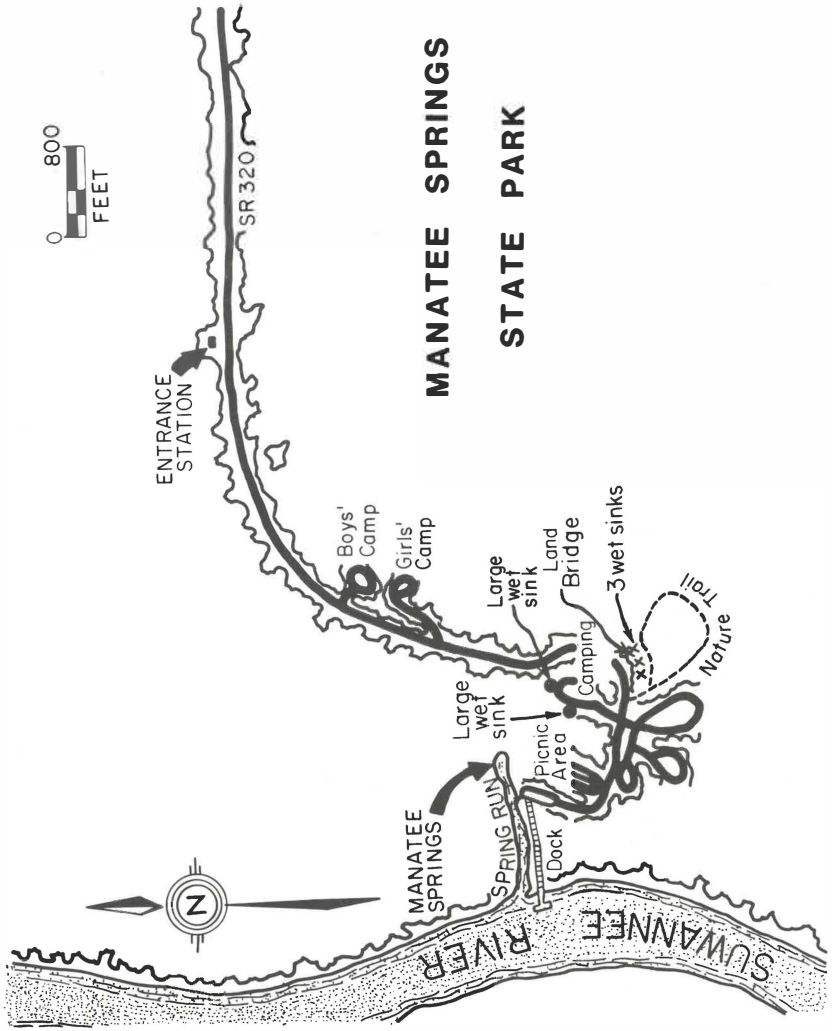
Approximately 1,500 feet down the trail is a long, narrow lake. The water in this lake, which has direct access to the aquifer, fluctuates in response to groundwater levels.

View of lake located on north side of River Nature Trail (water level responds directly to fluctuations in underlying aquifer).

The next geologic feature of interest is the River Sink, which is located at the eastern end of the trail. It is here, observable from several vantage points, that the Santa Fe River disappears and flows underground for more than 3 miles before it again becomes a surface stream. The waters of the river are literally "swallowed up" by vertical, 100 foot deep conduits. These conduits channel the water downward into the subsurface limestones where the water travels laterally for several miles through cavities before reappearing at the surface. Such a phenomenon, creating what is known as a natural bridge, is not unusual in these regions of springs and sinks.

As you leave River Sink you can see on the southern side of the trail, a large, shallow depression. Clearly marked with a park sign, this depression is a dry sink.

River Sink



MANATEE SPRINGS STATE PARK

INTRODUCTION

Manatee Springs is situated in a lush, semitropical, hardwood hammock just 23 miles northeast of the Gulf of Mexico. In addition to providing many recreational activities, the park contains excellent examples of karst landforms.

The park is located in the physiographic zone known as the Coastal Lowlands, with elevations ranging from a low of near mean sea level at the river to a high of 25 feet above MSL in the park's interior. The area is rich in history, for these springs were known and visited for centuries by the Indians and early Spanish explorers. Today, thousands of tourists come to enjoy the sparkling, clear waters and tranquil surroundings. In the winter its namesake, the endangered Florida manatee, sometimes visits the springs to enjoy its constant 72°F temperature.

THE SPRINGS

The spring head, which is located 1,200 feet from the Suwannee River, discharges 4.8 million gallons of water per hour. The water issues from rock which is part of the Ocala Group limestone, the same limestone formation that is found in O'Leno and Ichetucknee Springs state parks to the north. These rocks, which can be observed as outcrops around the pool's perimeter, are approximately 40 million years old.

An excellent view of the spring run can be

enjoyed from a boardwalk that leads from the boat launching area to the Suwannee River. Much of what may be seen as you walk along this boardwalk is similar to what was reported by William Bartram, a naturalist, in his visit to the spring in 1774. On this visit, he observed alligators, gar, catfish, mullet, trout, bream, pike and "the monstrous amphabious maneta (manatee)". He also noted great quantities of shells and shell fragments in and around the spring.

A large underwater cave system extends 2,000 feet from the main spring. Scuba diving in these caves is very popular, but dangerous, and safety is emphasized by park personnel.

View of the boil and spring run

NATURE (SINK) TRAIL

The Nature Trail begins at a point approximately one mile from the entrance station, just east of the camping area. This clearly marked trail leaves the main road and winds through a dense hardwood hammock toward the southeast. Visible on both sides of the trail are depressions, or sinks, of varying sizes and stages of development. Of particular interest is a series of three wet sinks located near the trail's end. Two of the sinks are connected by a narrow landbridge. This connecting bridge is underlain by rocks which have not experienced dissolution and subsequent collapse. In the future, the adjoining sinks may enlarge, engulfing the bridge.

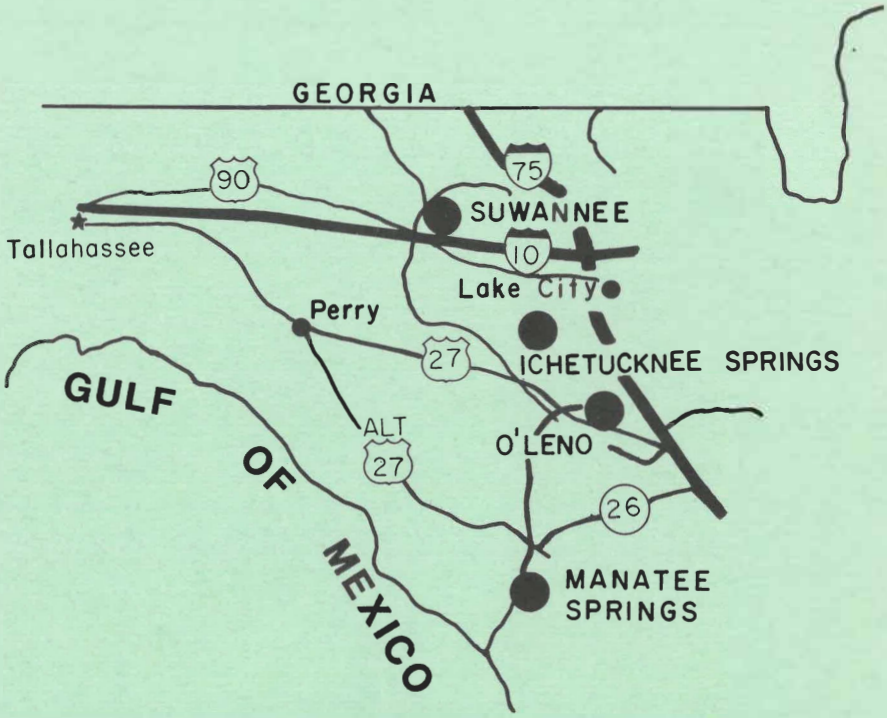
Two much larger sinks can be observed in the nearby camping area (see map). These sinks, which are filled with water, are connected via a network of underground solution channels to the main springs.

Information markers throughout the parks provide visitors with trail guides and descriptions of special features.

Two of the sinks are connected by a narrow landbridge. This connecting bridge is underlain by rocks which have not experienced dissolution and subsequent collapse. In the future, the adjoining sinks may enlarge, engulfing the bridge.

One of several wet sinks located along the Sink Trail.

GENERALIZED LOCATION MAP



This public document was promulgated at a total cost of $360.00 or a per copy cost of $.18 for the purpose of disseminating geologic data.